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RESOURCE MANAGEMENT AMONG INTENSIVE CARE NURSES: AN ETHNOGRAPHIC STUDY

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ABSTRACT

Background: Nurses are the main users of supplies and equipment applied in the Intensive Care Units (ICUs) which are high-priced and costly. Therefore, understanding ICU nurses' experiences about resource management contributes to the better control of the costs. **Objectives:** This study aimed to investigate the culture of nurses' working environment regarding the resource management in the ICUs in Iran. **Patients and Methods:** In this study, a focused ethnographic method was used. Twenty-eight informants among ICU nurses and other professional individuals were purposively selected and interviewed. As well, 400 hours of ethnographic observations as a participant observer was used for data gathering. Data analysis was performed using the methods described by Miles and Huberman (1994). **Results:** Two main themes describing the culture of ICU nurses regarding resource management included (a) consumption monitoring and auditing, and (b) prudent use. The results revealed that the efforts for resource management are conducted in the conditions of scarcity and uncertainty in supply. ICU nurses had a sense of futurism in the supply and use of resources in the unit and do the planning through taking the rules and guidelines as well as the available resources and their values into account. Improper storage of some supplies and equipment was a reaction to this uncertain condition among nurses. **Conclusions:** To manage the resources effectively, improvement of supply chain management in hospital seems essential. It is also necessary to hold educational classes in order to enhance the nurses' awareness on effective supply chain and storage of the items in the unit stock.

Key words: Materials Management, ICU, Ethnography, Culture, Nursing.

1. BACKGROUND

Intensive Care Units (ICUs) consume a large proportion of hospital resources and they are focused places in the hospital with well-defined boundaries (1-3). Medical resources such as drugs, supplies and equipment constitute a high proportion of costs in this unit. The management of these resources is an important factor in controlling hospital costs (4).

The management of resources is the responsibility of individual staff working in the care units (5). Nurses as the largest group providing healthcare in the hospital are the main users of resources and equipment at their workplace (6, 7). Thus, they play key roles in the appropriate use of health resources. Shortage of resources, administrative methods, and organizational culture are among the factors that affect the delivery of nursing care and use of resources (8). As well, the ICU environment with certain characteristics such as

critically ill patients, high mortality rate, unpredictable nature of the work, high use of resources, and more expensive equipment have led to a specific care culture (9, 10). Within this context, culture and beliefs can have an effect on the efficiency of nursing activities and resource management (11).

Culture is defined as a set of shared values and notions that influence the method of practicing activities in the working environment (9). Realizing the culture, especially tacit knowledge regarding resource management requires an understanding of individuals' perspectives, actions, speech, beliefs, and how they make sense of their own experiences (12). Although some studies have been conducted on the patterns of hospital resource consumption (13), allocative efficiency (14, 15), and the impact of underlying factors and lack of resources on nurses' performance (9, 16-19); the role of culture in the ICU nursing environment regarding the resource management is less investigated. Therefore,

in order to obtain a deep understanding of experiences of ICU nurses regarding the management of resources; there is a need to do a qualitative study to explain the resource management culture and to explore and realize the beliefs and opinions of ICU nurses on how to use and manage the supplies and equipment to implement appropriate changes in the health system based on the findings. This study aimed to investigate the culture of nurses' working environment regarding the resource management in the ICUs in Iran.

2. PATIENTS AND METHODS

In this study, focused ethnography was used to understand the culture of resource management by the ICU nursing staffs—as a group with a particular culture. Focused ethnography is very useful for healthcare research because it can be a practical and efficient way to gather data about a particular and important topic for individual clinicians, and to determine ways to improve care (20). This method will allow researchers to focus on specific topics instead of the whole and it is used when the researchers are closely familiar with the field of study (21). In this study, due to the long employment in the ICU as a clinical nurse as well as a clinical instructor for nursing students, the first author has insider status in the research settings.

Data collection had three components; (a) observation of unit activities and existing behavior patterns, (b) formal and informal interviews with unit nurses, and (c) interviews with managers and other health professionals. Observations were conducted as a participant observer in all weekdays except holidays, from October 2013 to May 2014 for 9 months. The observations were made first in a descriptive method and as the study progressed, they were conducted in selective and focused forms, respectively. During the observations, the routine activities, how to order, deliver, store and use the supplies and equipment as well as the documents of the unit and hospital were recorded as field notes. In addition, the researcher recorded the casual conversations and quoted stories by participating in the meetings, conferences, and break room. Interviews were done informally during the observations and formally through semi-structured interviews. Two main questions in the interviews included: (a) how do you describe the supply method as well as maintenance and use of the resources in your unit? (b) Do you have any experience regarding the resource management in your workplace? Also, some probing questions were asked to seek more information and clarify the responses.

This study was conducted in 4 ICUs of two large general teaching hospitals in Mashhad University of Medical Sciences in Iran (one medical and one surgical ICU in each hospital). The supply and distribution system of materials and equipment were the same and focused for all units. So that, the hospital supply center was responsible for providing medicines and the supplies and equipment required for entire units of hospital. The supplies were stored in the central pharmacy and warehouse after purchase. The number of beds in the different ICUs ranged from 8 to 15 beds per adult unit and the number of nurses varied from 18 to 35 individuals. In each unit, regulatory and administrative tasks were mostly performed by the head nurse and assistant head nurse, and each clinical nurse was responsible to

take care of two patients.

Key informants were selected through maximum variation sampling among the head nurses, assistant head nurses, nurses responsible for equipment and stock, and nurses with more than two years of experience. According to ethnographic sampling, good informants are ones that have enough experience on the phenomenon studied, are confident within their field and willing to discuss their experiences (22, 23). In addition, interviews were performed with other health professionals (physicians, supervisors, nursing aids, and secretaries) and the directors of linked units (pharmacies, warehouse, and logistics).

The study design was approved by the ethical committee of Mashhad University of Medical Sciences. Before each interview, all participants were informed about the goals and methods of the study. Participants were assured that their responses will be remained confidential.

Data management and analysis was performed simultaneously with data collection using the methods described by Miles and Huberman (1994) (24). Data collection continued until saturation and a rich description of the phenomenon under study was achieved. Following each field work, data were converted into write up. Then, using the contact summary sheet that had some focused and summarized questions for the data (Table 1); a general summary of the main points of the field was prepared. In addition to providing a general understanding of the data, this sheet is a good guide to plan next contacts (24). The recorded ethnographic interviews were transcribed. Analysis was conducted through an analytical rotating process and with an inductive reasoning approach. The researcher initially read the data to obtain a general understanding of them. Then, the texts of the data were examined in terms of their meanings and were coded in order to identify the descriptive codes or concepts. After conducting this procedure for several participants, a list of all the topics was collected. Similar topics were classified together and key events or pattern codes were extracted. The preliminary analyses were given to 5 participants for validation and clarification. As the study progressed and more data were collected, cultural themes were obtained from the classification of pattern codes.

Trustworthiness was maintained by using strategies of credibility, confirmability, dependability and transferability as described by Lincoln & Guba (1985). To this end, the following strategies were used: (a) extensive sampling of interview participants; (b) triangulation in data collection; (c) purposeful sampling of unit events for observation; (d) prolonged engagement in field observations; (e) member checking; and (f) completion of an audit trail that documented all results and extracted interpretations from the data. During the analysis, the interpretations were discussed in details by research team through regular sessions. The final analysis was reviewed by team members as well as by other researcher who was familiar with the research methodology.

3. RESULTS

The study population was composed of 106 nurses performing caring activities at 4 ICUs at two large general teaching hospitals in Mashhad, Iran who were observed for a long-time period (about 400 hours). Nurses aged 25

to 48 years ($M = 34$, $SD = 7.17$) and they all had a bachelor's degree in nursing and a working experience of 2 to 26 years ($M = 9$, $SD = 8.6$). Table 2 shows the characteristics of the 28 interviewed participants. Analysis of the data led to two important aspects of the ICU culture regarding the resource management, including (a) consumption monitoring and auditing, and (b) prudent use.

3.1. Consumption Monitoring and Auditing

Organizational culture influence on ICU culture and employee performance. Policies determined by the hospital management have an impact on caring culture and use of resources in the unit. The behaviors describing the theme of "consumption monitoring and auditing" can be expressed in the form of two sub-themes: "consumption control" and "consumption based on the price".

Observations and interviews indicated that the consumption of supplies and medications in the ICUs is monitored by hospital managers. This supervision is mainly provided in a periodic form by central pharmacy, warehouse and accounting department, and as well constantly by ICU head nurse and assistant head nurse. The ICU head nurses and the assistant head nurses seriously control the consumption of supplies and use of equipment in the unit and point to the importance of correct use to nursing staffs. One nurse said: "Our head nurse stresses that the right equipment need to be used in really necessary cases. Head nurse always states that if a device is damaged, you are practically disabled or sometimes the head nurse tells us to be more careful with the equipment."

The recorded used items were compared in the patient's chart and the HIS for controlling the medicine and supplies use. In cases where the consumption in the unit was not matched with the HIS records, the nurses in charge were questioned and they had to make it clear. One head nurse stated: "In the accounting department in hospital, there are several individuals responsible for controlling patients' records. These people have a duty to stop the deductions as much as possible. If there is a contradiction, we are held accountable and obliged to explain". These nurses believed that the audit and control of resource consumption in the unit increases the efficiency. One nurse stated: "Since there is more monitoring, consumption of medication and supplies is done more precisely and the accounts are more accurate. Control and strictness by management system has led to savings in the consumption of the items". One of the duties of nurses is recording consumed items in the HIS. One nurse while registering a patient's used materials in the HIS said: "We record all the consumed materials by a patient. We are obliged to register even the amount of iodine and cotton used for a patient".

Filed notes and interviews with nurses showed that there was a negative attitude towards the registration of medicines and supplies in the HIS. One nurse stated: "I hate registering medicines and consumed items. This is not part of our duty and it is not a specialist's task. A secretary can do it, too". The nurses sometimes did not record the used medications and supplies accurately in the HIS. In some cases, angiocath, catheter, serum were registered less than the actual amount of consumption.

The price of equipment and supplies was one of the factors affecting their consumption management. Costly pieces of equipment were more accurately used in comparison with

1.	What people, events, or situations were involved?
2.	What were the main themes or issues in the contact?
3.	Which research questions and which variables in the initial framework did the contact bear on most centrally?
4.	What new hypothesis, speculations, or hunches about the field situations were suggested by the contact?
5.	Where should the field-worker placed most energy during the next contact, and what kinds of information should be sought?

Table 1. Some questions in contact summary sheet

Age ($M \pm SD$)	41 \pm 6.71	
Work Experience ($M \pm SD$)	15 \pm 5.6	
Gender	Male (n)	12
	Female (n)	16
Job position	Head Nurse (n)	4
	Assistant Nurse (n)	4
	Clinical Nurse (n)	8
	support staff (n)	3
	Supervisor (n)	3
	Physicians (n)	3
	hospital pharmacy manager (n)	1
	hospital inventory manager (n)	1
	Hospital Purchasing Manager (n)	1

Table 2. Informants' characteristic of the study

less expensive ones. One head nurse said: "We always tell our colleagues to be careful with falling off the pulse oximeter cables on the ground, because the cords may be ripped. Since we know about their prices and their increasing cost trends".

The medicines with high expenses were more precisely monitored. Some certain medications were given to the ICU nurses in the form of "just-in-time" for reasons such as high cost, low consumption, and scarcity. Medications with lower prices and additional inventories were used less sensitively.

3.2. Prudent Use

Restrictions on the supply and lack of some items had an impact on nurses' beliefs and brought about behaviors in order to manage the consumption of resources. The behaviors explaining the "prudent use" can be classified into three sub-themes; including "overstocking", "contingency use", and "maintenance of equipment and devices".

3.2.1. Overstocking

ICU inventory was particularly important for head nurses and nursing staffs. Due to the fear of a possible shortage of some items, they try as much as possible to maximize the inventory and store the supplies. In this regard, one head nurse expressed: "Sometimes I fear that a device does not exist in the unit, therefore I try to increase my inventory in order to tackle the shortcomings. One of the reasons that sometimes some of items are available in the unit excessively is to be prepared for the circumstances in which there might be a shortage". Due to lack of some resources, nursing staffs were distrusted to the hospital's supply chain management. In this context, another head nurse expressed: "You are not always sure what you are asking is available. I fear that all the pieces of equipment required are not delivered".

Field notes also confirmed occasional shortage of consumables in the unit, so that the lack of items such as ventilator set, normal saline serum, and some medications were recorded on different days. Another significant issue

was that the head nurses and other nursing staffs were not aware of the different methods of ordering and storage of items in the stock. Orders for supplies especially lower-cost items were approximately made. Sometimes, overstocking a certain items had led to their expiry date. In such a situation, it means those items were phased out or improperly used. The field note revealed: *"There were a large number of sterile gloves and vaselined gas with near expiration date in the stock. There were also several items which were ordered and not used but expired"*.

3.2.2. Contingency Use

There was not enough care with the use of some supplies when they were available and frequent. The field note showed that items such as cotton, iodine, and suction catheter available in the unit stock to a large extent had a lot of losses. On the other hand, lack of some supplies led to savings in their use. Sometimes these savings were done in a correct manner and in most cases improperly. The field note demonstrated that lack of some medications had made the nursing staffs more careful in their maintenance and administration. Nevertheless, some cases such as the prolonged use of ventilator set, use of waste paper to dry hands, wearing the one glove to take care of several patients and some other cases were among the examples of false savings for supplies in short supply situations.

3.2.3. Maintenance of equipment and devices

The unit manager monitors the performance of equipment and their appropriate use. The field note revealed that *"At the beginning of each shift, assistant head nurse was delivered all the equipment from the previous shift and check their performance individually. The hospital management has also issued a checklist to each unit in order to evaluate the performance of various pieces of equipment."* Along with most of the equipment such as monitors, ventilators and electroshock; a training manual was also installed for their proper use. As well, periodic training classes were held for staff regarding the proper use of equipment. Due to limited financial resources, purchasing expensive equipment for hospital was a long process. This encountered ICU head nurses face serious problems with the provision and replacement for expensive equipment in the unit and put more emphasis on the maintenance and use of their equipment. One head nurse stated: *"We feel annoyed the time when we want to ask for some items from our system. To buy a mattress, we lose lots of energy. The replacement of devices and equipment is really time-consuming and difficult"*.

4. DISCUSSION

Two cultural themes of "consumption monitoring and auditing" and "prudent use" revealed that a particular culture has formed regarding the resource management among the ICU nurses in the field of the study. This culture, influenced by the organizational culture, has raised a shared knowledge among the ICU nurses; so that, the nurses have a sense of futurism in the supply and use of resources in the unit and do the planning through taking the rules and guidelines as well as the available resources and their values into account.

Stock inventory management is a serious issue. In the ICUs, there may be tendencies to store excessively due to the ambiguity and uncertainty in resource supply (4, 25). In this study, head nurses try to increase their available inven-

tory as much as possible because of their fears of a likely shortage in the unpredictable context of the ICU. As well, the head nurses and the nursing staffs did not have good knowledge of the stock inventory in the unit and some items expired due to their long-term storage. Therefore, nursing managers need to realize financial processes and inventory management and teach the personnel in this area in order to prevent their excessive storage (26). There are various methods to order for supplies in a predictable way to keep an adequate stock (7). As well, designing and implementing a systematic supply chain strategy in hospitals can access high-quality supplies in the quantities and sizes need for ICU patients (25). The empirical findings showed that nurse managers play a key role in shaping their working environments culture and the financial management of the ICU (9, 27). In this study, the roles of the head nurses and assistant head nurses in monitoring the performance of nursing staff regarding the use of resources; training on the maintenance and protection of equipment; awareness about the price of supplies and equipment; and cautions about the consequences of carelessness in the use of equipment were highly significant. Accordingly, an increase in the awareness level of head nurses and their active participation in resource management chain along with motivational factors can be an effective strategy for creating a culture of effective management of resources.

Monitoring and auditing the use of resources is one of the main methods to control the costs. In this study, the nurses believed that supervision had a positive effect on resource management in the unit. In a study about Controlling Medical Costs (28), it was revealed that financial managers and nurse executives considered accounting systems were moderately or very effective for cost containment and believed that the precise monitoring of the use of supplies and equipment effectively decreases the costs. The ICU personnel play an essential role in routine care of instruments and equipment, especially cleaning, checking for damage and reporting any defects (4). This study revealed that there are beliefs such as high-priced equipment, their problematic supply, and the prevention of disorder in caring services which make the ICU nurses obliged to protect the equipment and monitor their performance. It was revealed in a study (29) that nursing managers have a positive perception about the maintenance of equipment items and they believe that the equipment should be controlled periodically by people who are experts in this field.

In present study, control of pharmaceutical costs was one of the priorities of resource management in ICU. Medications are one of the costly components in healthcare systems especially in low- and middle-income countries. In order to keep the cost of medications in a reasonable range; the appropriate policies and controls on medication pricing and quantity are needed (30). Some countries have provided different approaches to cost containment of pharmaceutical expenditure through control policies on precise medicine administration and the establishment of medication and treatment committees to audit and promote the appropriate use of medicines (30, 31). According to the results, although nurses did not regard the practice of "registration" as part of their duties but believed that recording the medications

and consumable items improves the consumption of them. In different studies, a variety of reactions and sometimes contradictory responses from nurses towards electronic registration of health information and consumables have been reported (32, 33). Since use of the HIS as a recording technology is mandatory, its acceptance by nurses is important. If nurses find it as useless and impractical, it may be difficult to engage them continuously in using of the system (34). Therefore, it is of importance to examine the existing challenges and problems in this field in order to create favorable changes in the implementation of the HIS and careful registration of medicines and materials. Measures such as personnel training and their involvement in possible changes would be beneficial (32). Although we made efforts to maximize the diversity in the samples and the existing ICUs, the sample used in this study cannot be the representative of ICU culture regarding the resource management in all the ICUs in Iran. Therefore, the implications of the findings may be limited. However, the same care settings in Iran or abroad could make use of the results. The results of this study are limited to the ICUs in public training hospitals and it should be noted that there might be differences between the organizational culture as well as the supply of resources in public and private hospitals. Thus, it is essential to investigate the culture of the ICU nurses in private hospitals and compare their results with the findings of the present study.

5. CONCLUSION

The results showed that in the context of the study, the ICU nurses are in a situation of uncertainty and supply shortage. The nurses store supplies to ensure the availability in the units in the condition of existing uncertainty. The continuous supervision of management systems especially with regard to the value of the resources compels the nurses to be more careful in the use of the costly supplies and equipment. To manage the resources effectively in the ICUs, holding educational classes would increase nurses' awareness on how to supply and store the items. The improvement of supply chain in the hospital is also another necessity in order to make the resources available to the clinical nurses in the required conditions. As well, it would be helpful if nurses' comments are used on how to improve the audit systems and the registration of consumables. Nurses' involvement in the decision-making processes in the unit is also of importance.

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